

Focus on the Future

"The more things change," the French saying goes, "the more they remain the same." In several ways, that summarizes the history of the ARS regional research centers. So much has happened during the last 50 years: a rapidly increasing world population despite war, famine, and natural disasters; growing worldwide environmental concern; an explosion of scientific information; new technologies, including the invention of atomic weapons and atomic power; biotechnology and genetic engineering; the silicon chip and the modern computer; and hundreds of other innovations that have changed the lives of everyone on this planet.

But much is still familiar; many of the challenges that confront researchers today bear a striking resemblance to those of 50 years ago. When the regional laboratories began, they were charged with finding new uses and markets for surplus agricultural commodities to help improve farm income. Developing new products from surpluses is still a primary mission today. Fifty years ago, many people in the world went to bed hungry; tragically, even more people, including millions of children, are hungry and malnourished today. Many of the old threats to humankind's health and safety are still with us—and still dangerous—and new maladies sicken and kill uncounted millions. Environmental hazards, like floods, soil erosion, and agricultural wastes, were major concerns in the United States in the 1930's and 1940's; erosion and waste disposal and water management confront us in the 1990's, and with even greater urgency than in the past. Helping find answers to these and other problems through research continues after half a century to be the mission of ARS scientists in the regional centers.

The four original laboratories, along with the newer Richard B. Russell Agricultural Research Center in Athens, Georgia, recently completed a thorough reappraisal of their objectives. In several instances, they have been reorganized to strengthen their research programs, responding to needs of farmers and ranch-

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ers, processors and manufacturers, and consumers. They have also embarked on a much needed modernization of their physical plants to help them meet revised research goals.

Receiving renewed emphasis at the centers is the development of more value-added products derived from agricultural commodities. In a Senate directive accompanying the FY 1990 appropriation for the Department of Agriculture, the Congress called on USDA to "make substantial progress" in moving toward an annual program level of at least \$50 million to finance "research on new nonfood uses for traditional food commodities such as wheat, corn and soybeans..." The amendment observed that such a program "should help ensure a better balance between production and utilization research as well as higher prices for farmers, expanded international trade opportunities, and smaller Federal outlays for farm programs."

Congress is aware that many of the raw fruits, vegetables, grains, and dairy products exported by the United States for comparatively low prices are returned to this country as specialty foods and ingredients and pharmaceuticals. These are often sold to us at considerably higher prices than we received for the farm commodities from which they were derived. The development and production of more value-added agricultural products at home would bolster farm income and improve America's international trade balance. A related aim is to lessen U.S. dependence on foreign imports of strategic materials, such as natural rubber and petroleum.

The research plans of ARS program managers had called for more new product research at the utilization centers even before the Congressional directive made its appearance. Another continuing goal for the centers is the improvement of food and fiber products to make them more attractive to U.S. consumers as well as to foreign purchasers. As ARS Administrator R. D. Plowman said in remarks at ERRC's 50th anniversary open house, "A technological revolution is taking place in the food industry primed by changing consumer demands involving health, convenience, and even luxury. Consumers want products that are safe, nutritious, fresh-tasting, microwavable, and free from chemical additives. That translates into new opportunities, not only for the domestic market, but also overseas." Another



An important objective of the four regional research centers is the development of more value-added products from agricultural commodities. Many of the commercial items contain ingredients that are the result of ARS utilization research.

objective of center research is to contribute to a more healthful, productive environment and a sustainable agriculture.

Projects in support of these goals are currently being conducted at all the regional laboratories, and many of them respond to two or more objectives. In Peoria, for example, researchers are developing new chemical specialties from soybean oil.

A significant market for soybean oil opened up when, in 1988, Peoria researchers began work on colored printing inks. They formulated a 100-percent soybean oil that not only has a lower cost than petroleum-based inks, but also rewards printers with superior penetration of pigment into newsprint.

Partially soy-based inks, alternatives to conventional petroleum-based inks, had already been developed by the American Newspaper Publishers Association. In 1987, the *Cedar Rapids Gazette*, an Iowa paper, did a press run with these inks. The test was so successful that the paper decided to convert completely to partial soy-based colored inks.

However, the black soy inks didn't enjoy popularity with printers. Not only did the ink tend to rub off the printed page, but it was harder to clean the presses after a run.

Chemists at the Northern lab, at the behest of the newspaper publishers and the American Soybean Association, joined the effort to develop a 100-percent soybean oil newspaper ink. They successfully formulated inks in the four colors commonly used in newspaper printing: black, blue, red, and yellow. These inks are adjustable to a wide range of viscosity and tackiness for news offset printing. They're competitive to petroleum inks in cost, with rub-off characteristics equal to those formulated and marketed as low-rub inks.

In other Peoria new-product research, work continues to develop plastic mulches, films, and injection-molded plastics that incorporate starch in their formulations and that will biodegrade above or below the soil. Such new products would make use of surplus corn and help with solid waste disposal. Also, the use of starch-encapsulated pesticides, another Peoria invention, cuts down on air and water pollution by reducing the

application rate of herbicides and insecticides. In recognition of the Northern laboratory's successful value-added product research and its large number of patents and licensing agreements, the Congress on December 28, 1990, renamed it the National Center for Agricultural Utilization Research (NCAUR).

At the Western laboratory, a major goal is the production of natural rubber from bioreactor systems that use large quantities of cereal starch as a fermentation medium. The goal is to transfer genes from *Hevea*, the natural rubber tree, to a microorganism and then to use the microbe to produce rubber through fermentation. This is but one of several research projects at regional laboratories that seek to make use of fermentation systems to produce, not only rubber, but improved detergents, bioemulsions, organic acids, and anti-settling agents.

Other WRRC research seeks to transfer insect resistance from one species of plant to another and searches for ways to make crops more salt-tolerant. Another project looks for safer and more effective ways to eradicate the medfly with new approaches to biocontrol, and yet another would protect lightly processed fruits and vegetables with edible coatings.

In the South, researchers are working to develop innovative products from surplus tallow, butterfat, soybean oils, nonfat dry milk, and rice. Among other things, they are developing a brown rice with a shelf life two to three times that of today's product. New Orleans scientists are also learning more about how desirable and undesirable flavors are formed in foods, and they are looking for added-value products from surplus crops that can remove toxic wastes from industrial wastewater.

Redirected programs at the Eastern laboratory include making castor-oil-like products from animal fats. All of America's castor oil requirements are currently imported. ERRC scientists are also working to produce metal-chelating agents from carbohydrates and preparing polymers from pectin for use in biodegradable plastics or in medicine. Also under investigation are new uses for food stabilizers made by combining pectins with proteins.

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To meet growing consumer demand for food ingredients perceived as being safe, convenient, natural, and health-promoting, Eastern lab scientists are conducting promising research on fermentation systems to develop “natural” flavors from the action of fungi on butter. They are also working on improved computer models for predicting the growth and survival characteristics of foodborne pathogenic bacteria.

This is but a sampling of the exciting research projects now under way at the utilization laboratories. In what could well be a statement on behalf of all the centers, the Eastern laboratory, in concluding a 50th anniversary brochure, stated recently: “Thus as [we begin] the decade of the 90’s...much of our research has returned to that for which the four regional centers were originally established—utilization research.” To confront this challenge, the centers today have clear goals and experienced leadership, modern research facilities and equipment, improved mechanisms for technology transfer, and scientists with the education, experience, and enthusiasm to make their second half century even more productive than the first.

Sevim Erhan, a chemist in the Peoria center, prepares black and color newsprint inks made from 100-percent soybean oil for printing tests in the laboratory.

